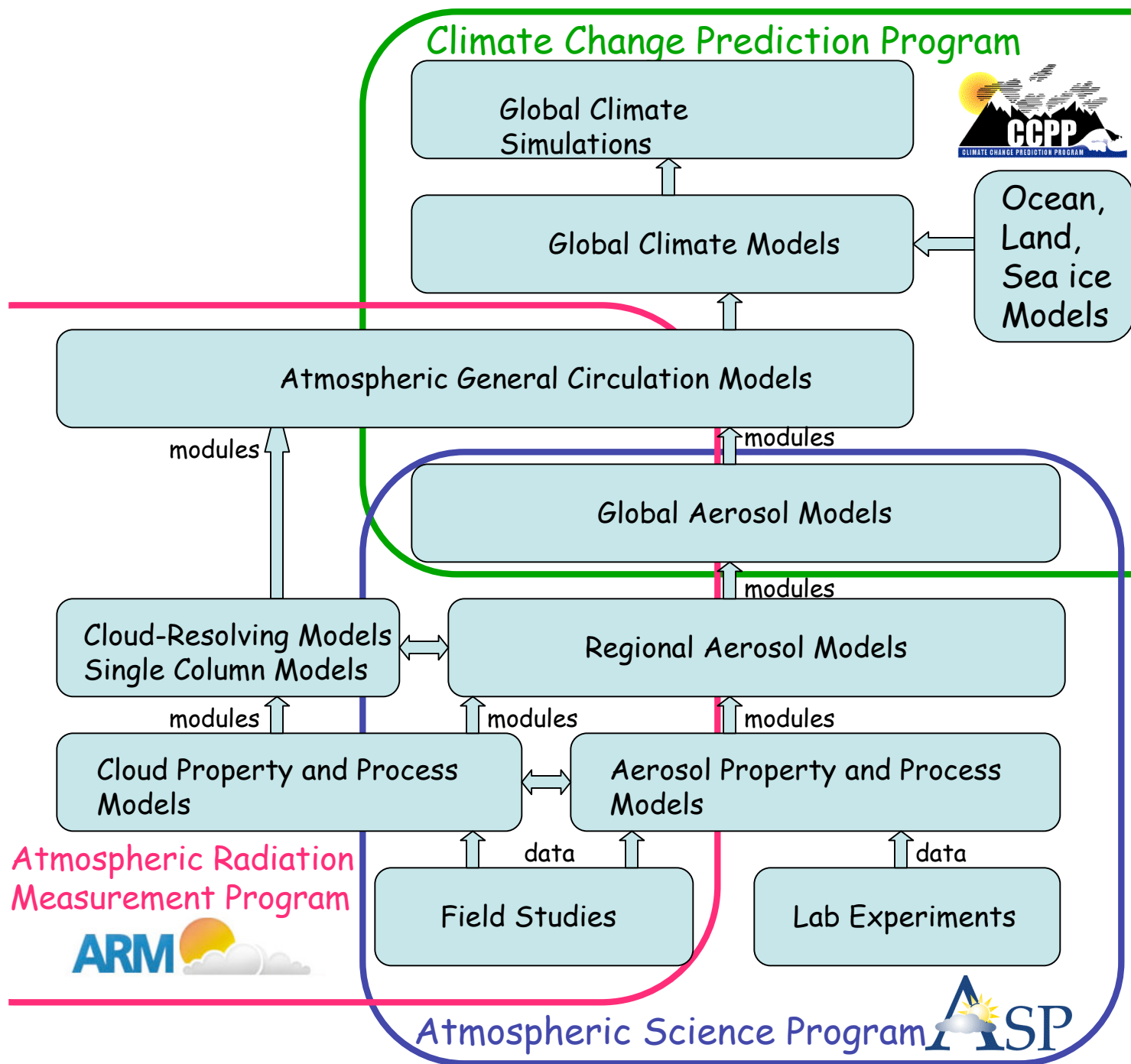


# Getting Aerosol Modules Into GCMs

Steve Ghan

Pacific Northwest National Laboratory



# How to Get Aerosol Process Modules into GCMs

- Talk with climate modelers about their current treatment
  - potential importance for climate
  - level of complexity, accuracy, cost per time step
  - information available as input
  - output required for impact on climate
- Demonstrate module performance in laboratory and/or closure experiments.
- Work with a modeler to test in an integrated aerosol model.
- Use sensitivity experiments to determine minimum level of complexity required to improve treatment of the process.
- Address issues of spatial scale and resolution.
- Work together with a climate modeler at a major modeling center to implement and evaluate your module in a climate model.
- Perform sensitivity experiments with the climate model to determine whether online treatment is necessary.

# Closure Experiments

Experiment	Input Data	Validation Data	Reference
Aerosol mass concentration	Ions, BC, organic, dust concentration	Total mass concentration	Zhang et al. (2005)
Refractive index	Ions, BC, organic, dust, mixing state	Refractive index	
Radiative absorption	Ions, BC, organic, dust, size distribution, mixing state	absorption	
Radiative scattering	Ions, BC, organic, dust, size distribution, mixing state	scattering	Clarke et al. (2002)
Radiative extinction	Ions, BC, organic, dust, size distribution, mixing state	extinction	Wang et al. (2002)
New particle formation	CNC, ultrafine size distribution, $\text{H}_2\text{SO}_4$ , $\text{NH}_3$ , organic vapor	CNC, ultrafine size distribution	McMurry et al. (2005)
CCN concentration	Ions, BC, organic, dust, aerosol size distribution	CCN concentration	Cantrell et al. (2001); Gasparini et al. (2006)
Water uptake	Ions, BC, organic, dust, aerosol size distribution, RH	Humidification size factor, extinction factor	Swietlicki et al. (1999); Dick et al. (2000)
Aerosol activation	CCN spectrum, ions, BC, organic, dust, aerosol size distribution, updraft velocity	Droplet number, activated aerosol size distribution	Conant et al. (2004); Meskhidze et al. (2005)
Droplet collision /coalescence	Vertical profile of droplet size distribution	Drizzle size distribution	Wood (2005)